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SHORT COMMUNICATION

Omorgus suberosus and *Polynoncus bifurcatus* (Coleoptera: Scarabaeoidea: Trogidae) in exotic and native environments of Brazil

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ABSTRACT. Trogidae beetles are important for the decomposition of organic material in ecosystems. In the Neotropical region, little is known about this family, except for their taxonomy. In this study, we report the presence of *Omorgus suberosus* (Fabricius, 1775) and *Polynoncus bifurcatus* (Vaurie, 1962) in exotic and native environments of Brazil, sampled with different baits. The beetles were captured in pastures with introduced grass (*Brachiaria* spp.) and in patches of native forest (Brazilian savanna). We used pitfall traps baited with carrion and human feces every two weeks, from January to December 2011, and with carrion, cow dung, human feces and pig manure at the beginning of the rainy season (October 2011). Over the course of one year, 24 individuals of *O. suberosus* were captured, 16 in the exotic and eight in the native environment, respectively. In the sampling performed at the beginning of the rainy season, 32 individuals of *O. suberosus* and seven of *P. bifurcatus* were obtained. *Omorgus suberosus* specimens were sampled in both environments, suggesting a possible tolerance to anthropogenic environments, as in the case of introduced grasses. *Polynoncus bifurcatus* individuals were captured only in native environments, which may indicate a strong relationship with more heterogeneous and/or relatively preserved habitats. We discuss such relationships in light of published data and new information provided here.

KEY WORDS. Agro-pastoral landscape; *Brachiaria* spp.; copro-necrophagous beetles; ecological services; insect biodiversity.

Trogidae beetles (Coleoptera: Scarabaeoidea) are a cosmopolitan group with approximately 300 described species worldwide (Scholtz 1986). Most occur in arid regions of the southern hemisphere (Scholtz 1982). Africa possesses the most diverse fauna (70 species), followed by Australia (53), South America and its islands (47) and North America (41) (Scholtz 1990). In the Americas, 88 species are represented all in *Omorgus* Erichson, 1847, *Polynoncus* Burmeister, 1876 and *Trox* Fabricius, 1775. *Omorgus* is widely distributed throughout South America, Africa and Asia (Scholtz 1982), whereas *Polynoncus* is endemic to South America (Scholtz 1990). In South America, *Trox* is represented by *Trox juglans* (Ratcliffe, 1978) and *Trox scaber* (Linnaeus, 1767), which was probably introduced from Europe (Scholtz 1990).

Larvae and adults of these beetles are generally found associated with the last stage of decomposition of animal remains (Vaurie 1962). They have also been reported feeding on grasshopper eggs (Baker 1968), guano of cave bats, fly larvae, as well as old carpet, felt hats, leather cushions and horse mane (Scholtz 1990). It is believed that some species are exclusive to nests of birds of prey such as owls (Vaurie 1962), while others have been found in the burrows of carnivorous animals (Scholtz 1990), nests of mammals (Vaurie 1962, Morón & Deloya 1991) and those of sea turtles, in the latter case causing population declines (Rosano-Hernández & Deloya 2002).

In the Neotropical region, studies on Trogidae beetles are scarce. Gianizella & Prado (1999) and Lopes *et al*. (2007) collected these beetles in the manure of laying chicken in the state of São Paulo, in southeastern Brazil. In this country, no studies that seek to understand the abundance and richness of Trogidae beetles in native and exotic environments have been performed to date. Therefore, in this study we provide information on *Omorgus suberosus* (Fabricius, 1775) and *Polinoncus bifurcatus* (Vaurie, 1962) sampled with different baits in exotic (pastures of *Brachiaria* spp.) and native (patches of Brazilian savanna) environments.

Beetles were sampled in the transition region between the Pantanal and the Cerrado ecosystems in Aquidauana city, Mato Grosso do Sul, Brazil (20°28'15"S, 55°47'13"W). There, annual rainfall ranges from 1,200 to 1,300 mm and the mean annual temperature is 26°C.

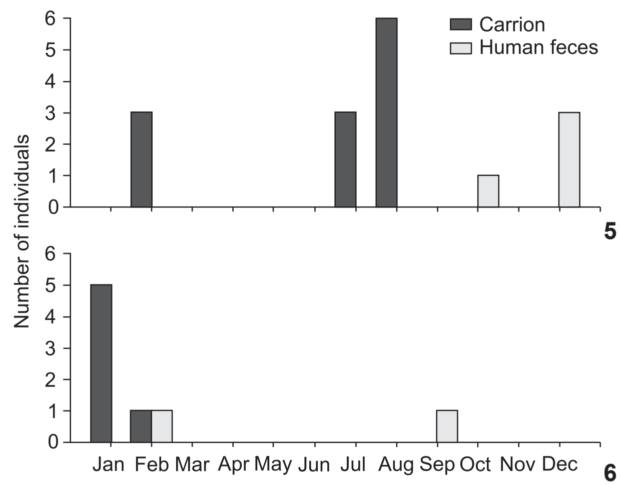
Every two weeks, from January to December 2011, ten traps were installed and baited interchangeably with carrion (rotten meat) and human feces in an exotic pasture (*Brachiaria* spp.) frequented by cattle, and a patch of native forest (Brazilian savanna). The pitfall traps (1000 mL) were installed at ground level and separated by a distance of 20 m. The baits were placed in individual plastic containers (50 mL) at the center of each trap using wire. Each trap contained approximately 250 mL of a 1.5% liquid detergent solution and remained active in the field for 48 hours.

At the beginning of the rainy season (October 2011), an ample sampling of Trogidae beetles was conducted in the native and exotic landscapes encountered in the area, utilizing the same collecting procedures as described above. Beetles were collected in two patches of native vegetation (Brazilian savanna), and four areas with the exotic grass *Brachiaria* spp. The patches of savanna were separated by approximately 14 km, while the pasture areas by a minimum distance of 1.8 km. The traps were placed in each of the six areas, on four linear transects separated by 100 m. The traps were placed in previously defined points separated by 50 m, totaling three points per transect. At each point four traps were installed at the distance of 10 m from each other. Four different baits (carrion, cow dung, human feces and pig manure) were individually placed in plastic containers at the center of each trap.

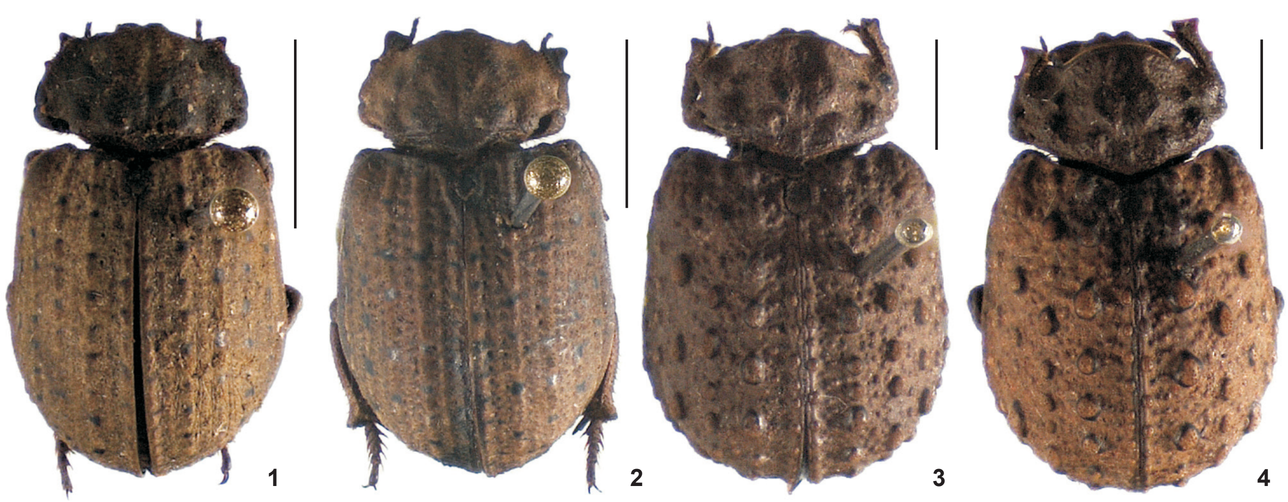
Adults (Figs 1-4) were compared with named specimens of Trogidae deposited at the collection of the Entomology Section of the Coleção Zoológica da Universidade Federal de Mato Grosso (UFMT, Cuiabá, Mato Grosso, Brazil) and identified by curator Dr. Fernando Z. Vaz-de-Mello. Voucher specimens are deposited in the UFMT collection.

Images of pinned specimens (Figs 1-4) were taken with a Zeiss Axiocam MRc digital camera attached to a Zeiss Discovery V8 stereomicroscope. Final images were compiled by combining about 30 photograph layers, each taken at a different focus, using the extended focus module of Zeiss Axiovision 4.8 software.

A total of 24 individuals of *O. suberosus* (Figs 1 and 2) were collected from January to December 2011. Sixteen individuals were sampled in the exotic environment and eight in the natural environment (Figs 5 and 6). In the traps baited with carrion, 18 individuals were sampled, while six were captured with human feces (Figs 5 and 6). Five individuals were sampled in January, five in February, three in July, six in August, one in September, one in October, and three in December (Figs 5 and 6).

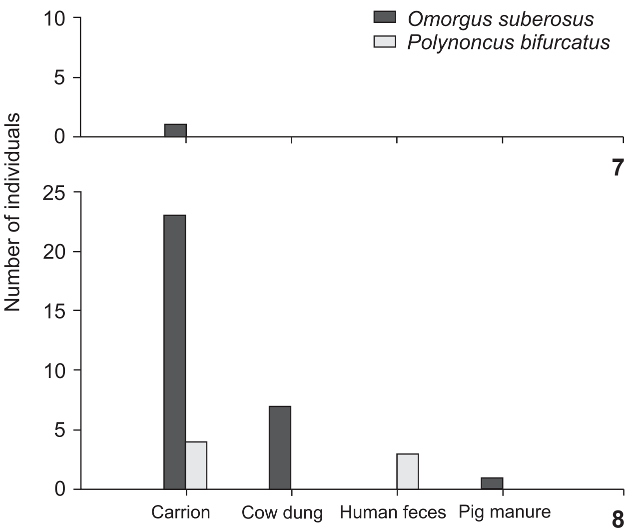


Figures 5-6. Abundance of *Omorgus suberosus* sampled with pitfall traps baited with carrion and human feces, in (5) exotic (pasture of *Brachiaria* spp.) and (6) native environments (Brazilian savanna) from January to December 2011, in Aquidauana, Mato Grosso do Sul.



Figures 1-4. *Omorgus suberosus*: male (1) and female (2); and *Polynoncus bifurcatus*: male (3) and female (4). Scale bars: 1-2 = 5.0 mm, 3-4 = 2.0 mm.

At the beginning of the rainy season, 32 individuals of *O. suberosus* (Figs 1 and 2) and seven of *P. bifurcatus* (Figs 3 and 4) were collected, two in the exotic environments and 37 in the native environments (Figs 7 and 8). *Omorgus suberosus* was sampled in both environments (Figs 7 and 8), while *P. bifurcatus* only in the native environments (Fig. 8). Twenty-four individuals of *O. suberosus* were captured in traps baited with carrion, seven with cow dung and one with pig manure (Figs 7 and 8). Four *P. bifurcatus* individuals were sampled in traps baited with carrion and three with human feces (Figs 7 and 8).



Figures 7-8. Abundance of *Omorgus suberosus* and *Polynoncus bifurcatus* sampled with pitfall traps baited with carrion, cow dung, human feces and pig manure in exotic (pasture of *Brachiaria* spp.) (7) and native environments (Brazilian savanna) (8), in Aquidauana, Mato Grosso do Sul.

Samples collected throughout the year in exotic and native environments captured *O. suberosus* in different months (Figs 5 and 6). In Brazil, Lopes *et al.* (2007) mentioned that climatic factors are mostly responsible for the seasonality of this species, and that the largest number of individuals is found in the rainy season in poultry farms. In landscapes native to Mexico, Trevilla-Rebollar *et al.* (2010) sampled 12 individuals from April to December with traps baited with carrion, while Mora-Aguilar & Montes de Oca (2009) collected only two individuals in June and July, also in native landscapes. It is therefore believed that the emergence and reproduction of adults occurs during the entire year, since the biological cycle of Trogidae beetles is usually relatively short (~ 6-8 weeks) (Scholtz 1986).

At the beginning of the rainy season, the greatest number of *O. suberosus* was registered in the native environment (Fig. 7). By contrast, over the sampling period of one year, more specimens were registered in the exotic environment (Fig. 5). Therefore, we believe that the greater abundance of individuals in the native environment at the beginning of the rainy season may be related to the higher sampling effort there, including the use of different baits.

Larvae and adults of Trogidae beetles are generally associated with the last stage of decomposition of animal remains (Vaurie 1962). The scavenger feeding habit was probably crucial for the collection of these beetles in traps baited with carrion, especially *O. suberosus*. There is little information regarding the feeding habits of this species, but in this study *O. suberosus* was sampled in traps baited with carrion, cow dung, human feces and pig manure, indicating a probable generalist feeding habit. Gómez (2005) sampled *O. suberosus* in the woodlands of Argentina using traps baited with rotten meat and human feces, and in Brazil this species had previously been encountered on poultry manure (Gianizella & Prado 1999).

In this study *O. suberosus* was sampled in both environments, suggesting a probable tolerance to anthropogenic environments, as in the case of introduced grass. The records of occurrence of populations identified as belonging to *O. suberosus* in areas previously not colonized by this species are old and have grown over the years (see its distribution in Scholtz 1990 and Deloya 2005). Considering that *O. suberosus* is native to South America (Scholtz 1990), the presence of the populations of this species in other continents can be interpreted as a result of introduction during bygone events. Although they have spread remarkably fast, the reasons for the success of the invasion of *O. suberosus* into new habitats remain unclear. The scarce knowledge about the biology of these beetles has limited the explanations for this development, and hindered studies on the ecology of this species and its potential impact on native fauna (Antunes-Carvalho & Lopes-Andrade 2013).

Here, our data support the hypothesis that *O. suberosus* has probable generalist feeding habits, which suggests the ability to explore a range of food resources. Because the diet breadth has been seen as a characteristic involved in the invasion success of beetles (e.g., Antunes-Carvalho & Lopes-Andrade 2013) this could indicate more potential for colonization of new habitats by *O. suberosus*. However, this information is still scarce for *O. suberosus* and most of *Omorgus* species.

Polynoncus bifurcatus apparently has generalist feeding habits, since it was captured in traps baited with carrion and human feces. This species is distributed in Argentina, Bolivia, Brazil and Paraguay (Vaurie 1962, Scholtz 1982), but virtually nothing is known of its biology. *Polynoncus bifurcatus* was only sampled in native environments, which probably indicates its strong relationship with more heterogeneous and/or relatively preserved habitats. Native landscapes such as the Brazilian savannas typically harbor a greater range of animals. Therefore, the availability of resources (e.g., carrion and feces) may be greater there, as well as variations in vegetation structure that could enhance and/or maintain local diversity (Driscoll & Weir 2005). The Brazilian savanna is one of the 25 areas around the world considered to be conservation hotspots, due to its large number of endemic species and the high speed at which it has been impacted by humans (MYERS *et al.* 2000). Therefore studies on the understanding of animal communities in this ecosystem are important.

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